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Acquisition of Scanning Laser-Doppler Vibrometer System for Detection and Nondestructive Characterization of Interfaces

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12 a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; distribution unlimited.

12 b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

The objective of this grant is to purchase a Scanning Laser-Doppler Vibrometer System PSV-300-H from Polytec PI. The system was acquired for the total cost of $166,450 of which $40,000 was provided by this DURIP grant. The rest of the funds came from research contract and matching contribution ($50,000) from Stevens Institute of Technology. The system was delivered in Spring of 2000 and was extensively utilized in ARO projects # DAAG-98-1-0402 and # DAAD19-00-1-0039 related to the Nonlinear Seismo-Acoustic Land Mine Detection and Discrimination Technique. Thus, the Scanning Laser-Doppler Vibrometer System became major measuring tool in both laboratory and field tests.

The utilization of the system also contributed to education and outreach efforts. A number of graduate students had used the system while working for the ARO and other projects. The system was extensively used for numerous demonstration of the developed land mine detection technique to potential industrial partners, investors, as well as to groups of high school and undergraduate students.

14. SUBJECT TERMS
Scanning Laser-Doppler Vibrometer System, acquisition, land mine detection and discrimination, nondestructive characterization

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1. List of manuscripts

Dimitri M. Donskoy, Alexander E. Ekimov, and Jianhui He. Nonlinear seismo-acoustic land mine detection and discrimination. Journal of Acoustical Society of America, v.108, no.5, p.2649, 2000

Dimitri Donskoy, Nikolay Sedunov, and Edward Whittaker, Phase-amplitude-modulated laser and microwave vibrometers. Journal of Acoustical Society of America, v.108, no.5, p.2623, 2000

Dimitri Donskoy, Nikolay Sedunov, Alexander Ekimov, and Charles Cannon, Nonlinear seismo-acoustic land mine detection: method and instrumentation. Proceedings of UXO –Countermine Forum, 2001

Dimitri Donskoy, Nikolay Sedunov, Alexander Ekimov, and Mikhail Tsionskiy, Optimization of Seismo-Acoustic Land Mine Detection Using Dynamic Mechanical Impedances of Mines and Soil. Submitted to Proceedings of SPIE – The international Society for Optical Engineering "Detection and Remediation Technologies for Mines and Minelike Targets YI", 2001

2. Scientific personnel

Dimitri Donskoy (PI)
Edward Whittaker (Co-PI)
Nikolay Sedunov (Research Engineer)
Alexander Ekimov (Research Scientist)
Mikhail Tsionskiy (Graduate Student) – awarded master's degree
Jianhui He (Graduate Student) – awarded master's degree
Dennis Hromin (Undergraduate student) – awarded bachelor's degree

3. Report of inventions

D.Donskoy and A.Sutin, Method and apparatus for acoustic detection of mines and other buried man-made objects, U.S.Patent #5,974,881, 1999

D.Donskoy and A.Sutin, Method and apparatus for acoustic detection of mines and other buried man-made objects, U.S.Patent #6,134,966, 2000

D.Donskoy, N.Sedunov, and E.Whittaker, Phase-Amplitude Modulation Elecromagnetic Wave (PAM-EW) Vibrometer, Patent pending, 2000

4. Scientific progress and accomplishments

The acquired Scanning Laser-Doppler Vibrometer System was extensively utilized in ARO projects # DAAG-98-1-0402 and # DAAD19-00-1-0039 related to the Nonlinear Seismo-Acoustic Land Mine Detection and Discrimination Technique. The System became major measuring tool in both laboratory and field tests allowing successful progress of these research projects. Thus, the underplaying physical mechanism of the detection technique was experimentally validated using the System.

The utilization of the system also contributed to education and outreach efforts. A number of graduate students had used the system while working for the ARO and other projects. The system was extensively used for numerous demonstration of the developed land mine detection technique to potential industrial partners, investors, as well as to groups of high school and undergraduate students

5. Technology transfer

The acquisition and extensive utilization of the Scanning Laser-Doppler Vibrometer System to the great extent supported the transition of 6.1 ARO projects to 6.2 program directed by U.S.Army SECOM at Fort Belvoir.